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UNITED STATES ARMY AVIATION BOARD
Fort Rucker, Alabama

144 ATBG-SEC-AVN-1161

15 MAY 1961

SUBJECT: Report of Test, Project ATBN-1161, "Evaluation of XM-143
Photoflash Cartridge,"

TO: Commanding General
United States Continental Army Command
ATTN: MD
Fort Monroe, Virginia

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1. AUTHORITY.

a. Directive. Letter, ATDEV-5 471, Headquarters, United States Continental Army Command, 19 August 1960, subject: "Evaluation of Photoflash Cartridge XM-143."

b. Purpose. To conduct an evaluation of the XM-143 Photoflash Cartridge to determine:

- (1) Its suitability for firing over friendly troops.
- (2) Its adequacy for night photography.

2. BACKGROUND.

a. A requirement exists for a suitable photoflash cartridge for use with airborne cameras in peacetime maneuvers. The charge case of the standard M112 photoflash cartridge is made of metal and produces sizable fragments when detonated.

b. In a letter to Chief of Ordnance dated 4 September 1958, the Commanding General, US Continental Army Command, stated that safety requirements precluded the use of M112 and M123 Photoflash Cartridges over troops and materiel during training and peacetime maneuvers. As a consequence, development of the XM-143 Photoflash Cartridge was initiated to produce a cartridge which would have the same characteristics and time fuse delays as the M112, except that the charge case and fuse housing would be made of plastic instead of metal, the plastic fragments to be consumed by burning.

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USAAVNTBD

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c. In May 1959, at Picatinny Arsenal, Dover, Delaware, a quantity of plastic charge cases was fabricated and tested for functioning, fragmentation, light characteristics, delay time, and ejection velocities.

d. A combined engineering evaluation and user test of the cartridges was conducted at Aberdeen Proving Ground, Maryland. Results of this test indicate some undesirable fragmentation occurred (paragraph 10e).

e. The equipment was received by the Aviation Board, 29 August 1960. A maintenance package is not required.

3. DESCRIPTION OF MATERIEL.

a. The plastic charge case for the XM-143 Photoflash Cartridge is 6.20 inches long and 1.48 inches in diameter and is filled with approximately 6.7 ounces of photoflash composition. A delay fuse, 4.0 ± 0.4 seconds, is inserted in the end of the charge case.

b. The XM-143 Photoflash Cartridge is 7.81 inches long and 1.57 inches in diameter. The cartridge case is made of extruded aluminum and contains the charge, and an M59 electric primer. The weight of the complete XM-143 Photoflash Cartridge is one pound.

c. The cartridge is designed to provide an aerial flash to illuminate surface areas permitting night photography with minimum hazard to friendly troops on the ground. The charge case is ejected from the cartridge case using an ejecting device controlled by a 27.5 volt d.c. electrical pulse. The M59 electric primer ignites the black powder ejecting charge which in turn ignites the fuse in the charge case as it is fired from the cartridge. The cartridge case remains within the ejecting device. Approximately four seconds after ejection the charge explodes and produces a flash of light.

4. SCOPE. A total of 100 cartridges was fired from L-20 and A0-1 airplanes at various altitudes over three test sites:

a. Site 1 - Asphalt runways which provided a smooth, clean area from which fragments could be retrieved.

b. Site 2 - An unimproved field on which twelve 3-foot x 150-foot cheese-cloth strips, with balloons attached to each side at six-foot intervals, were placed in parallel six feet apart and one foot

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above the ground. Testing was conducted at this site in an effort to determine the burst radius which might be lethal.

c. Site 3 - A firing range impact area which was used for night photography.

5. TESTS.

a. Operational Characteristics.

(1) Cartridge Ejection and Firing. The XM-143 was found to be reliable. Ejections were made at various absolute altitudes between 400 and 3000 feet. All 100 cartridges ejected satisfactorily and fired in the air with the following exceptions: After ejection at approximately 400 feet absolute altitude over Site 1, three cartridges broke apart on impact with the runway without detonating. After ejection at the same altitude over Site 2, three cartridges struck the soft earth, did not break apart, and were detonated by the time fuses.

(2) Cartridge Fragments. Fragments of varying sizes, shapes, and weights up to 5.9 grams were recovered (one hundred grams equal 3.5 ounces) after detonations at the surface and at various altitudes over open areas (Sites 1 and 2).

(3) Effect of Airspeed on Height of Burst. An L-20 was flown at 550 feet absolute altitude and at indicated airspeeds of 55, 80, 90, 105, and 115 knots to determine the effect of airspeed on the height of burst. There was no apparent difference in the height of burst. (See paragraph 6b below.)

(4) Minimum Safe Altitude for the Explosion of the Charge. The maximum blast radius for injury to personnel was approximately 150 feet. Therefore, the desired height of burst to provide adequate safety for friendly troops was determined to be not less than 350 feet. Downward ejection of the cartridge with a four-second fuse should be made at not less than 800 feet above the terrain.

(5) Light Intensity. The KS-61 Camera System mounted in an A0-1 Airplane was used to photograph Site 3, using M-112 cartridges and XM-143 cartridges. Photographs were taken at absolute altitudes between 500 feet and 3000 feet and at varying airspeeds between 100 knots and 200 knots. A comparison between the photographs obtained with the use of the M-112 and the XM-143 indicates that a lesser intensity of light was provided by the XM-143, but was adequate for night photography.

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(6) Fuse Timing. When using a four-second fuse cartridge, the AO-1 had to be flown at airspeeds below 150 knots to avoid outflying the lighted area. This caused the airplane to fly in a nose-high attitude, thereby introducing a distortion to the photographs.

b. Safety. The normal precautionary procedures for storing, transporting, and loading ammunition were followed and were considered adequate for handling the XM-143 Photoflash Cartridges. The XM-143 round included a metal shunting clip over the base of the case to prevent accidental firing. No adverse effects on the airplanes were noted as a result of ejecting and firing.

c. Maintenance. Installation of the ejecting device and controls on the L-20 and the AO-1 was accomplished by the US Army Signal Aviation Test and Support Activity. No maintenance was required.

6. CONCLUSIONS.

a. Subject to the restriction noted in paragraph 5a(4) above, the XM-143 Photoflash Cartridge is suitable for firing over friendly troops.

b. Light intensity of the XM-143 is acceptable for night photography.

c. A photoflash cartridge incorporating a four-second delay fuse is impractical for use with the AO-1.

7. RECOMMENDATION. It is recommended that the appropriate technical service review present or proposed camera systems and carriers to determine delay requirements for photoflash cartridge fuses.

8. COORDINATION. This report has been coordinated with the US Army Aviation School.

9. REFERENCES.

a. Line Item No. F138, Annex F, Materiel Developments Program, FY 61, Headquarters, USCOMARCS.

b. Test Program Request No. TS-9, Picatinny Arsenal, Dover, Del., pertaining to plan of test for Cartridge Photoflash, XM-143, 29 February 1960.

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c. USCOMARC Liaison Report, APG-Infantry 85-60, Aberdeen Proving Ground, Maryland, 14 March 1960, subject: "Cartridge, Photoflash, XM-143."

d. USCOMARC Liaison Report, APG-Aviation 8-60, Aberdeen Proving Ground, Maryland, 5 April 1960, subject: "Cartridge, Photoflash, XM-143."

e. Test Report Nr DPG 84, Aberdeen Proving Ground, November 1960, subject: "Engineering Evaluation Test of Cartridge, Photoflash, XM-143."

f. Plan of Test, Project Number AVN 1161, "Evaluation of the XM-143 Photoflash Cartridge, 8 December 1960."

g. Message 3-64, US Army Aviation Board, 24 March 1961.

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